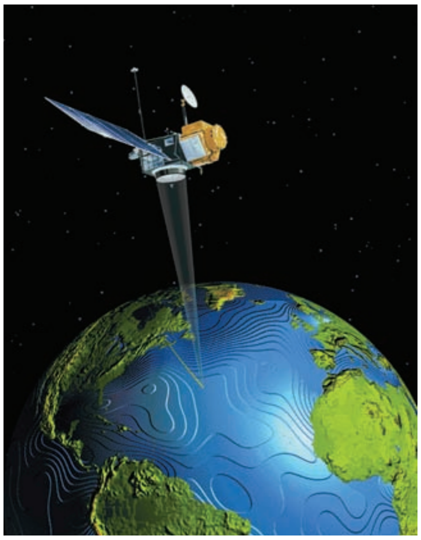
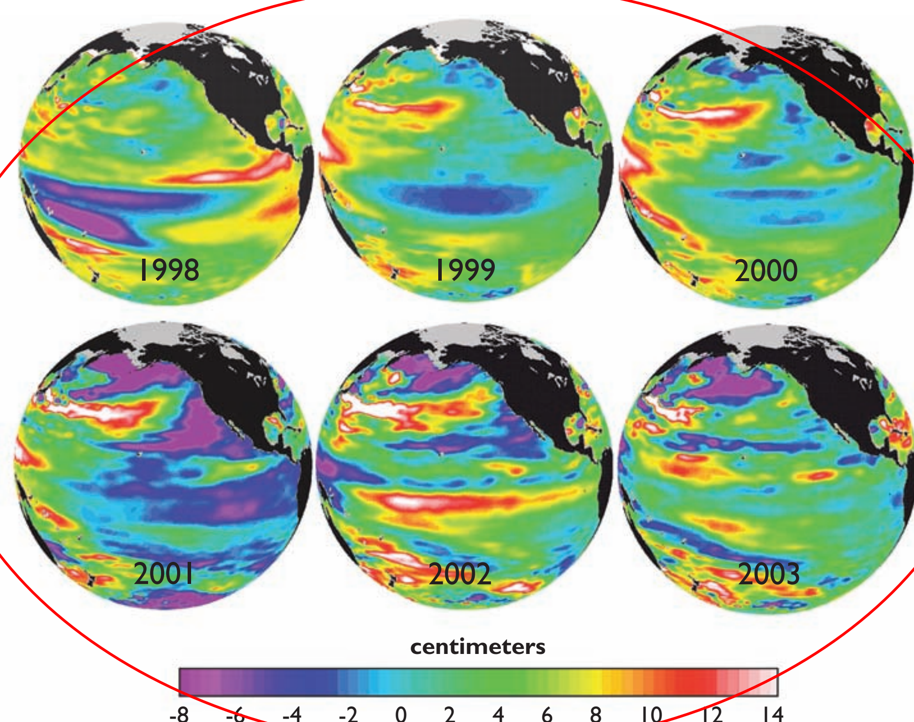


Artist's rendition of TOPEX/Poseidon making measurements of ocean surface topography. (Illustration by L-L Fu.)

scales of weeks to years. This ability to map the ocean surface topography marks a milestone in the understanding of ocean circulation and its effects on climate.

The most energetic variability of ocean circulation is in its eddies, which are the 'storms' in the ocean currents. The diameter of these eddies is about 100 kilometers and they typically pass by a location in a month with current speeds of 10 to 100 centimeters per second. The intensity and tracks of these eddies have been mapped using satellite data. The 'storm' alleys of the ocean are located in the vicinity of the major ocean currents: the Gulf Stream, the Kuroshio to the east of Japan, the East Australian Current, the Brazil-Malvinas Confluence, and the Antarctic Circumpolar Current. Ocean eddies play an important role in ocean circulation, heat transport, and biogeochemical cycles. Our ability to monitor them from space has applications in navigation, offshore operations, and in fishery, hurricane, and climate forecasting.

The ocean is also changing on time scales from years to decades. The heating and cooling of the ocean by the atmosphere causes the expansion and contraction of the ocean, leading to the seasonal rise and fall of sea surface. Over time scales of three to seven years, El Niño and La Niña create massive redistributions of heat in the ocean. After the strong El Niño in 1997, the Pacific Ocean went into a prolonged La Niña cycle from 1998 to 2001, with lower topography (less heat storage) in the eastern Pacific and higher topography (more heat storage) in the western Pacific. Subsequently, the large-scale pattern of the surface topography of the Pacific Ocean seems to have transformed into a phase of the so-called 'Pacific Decadal Oscillation', a long-lived El Niño-like pattern of Pacific climate variability with a time scale of 20 years. Such long-term changes in the ocean are linked to the variability of the atmosphere and have large-scale, long-lasting impacts on the weather and climate of the world. However, a 10-year record is too short to tell the whole story about global change in the ocean. Jason, the follow-on satellite to TOPEX/Poseidon, is currently flying side-by-side with TOPEX/Poseidon thus providing twice the spatial coverage. Jason, together with future satellite altimeters, will continue the measurement of ocean surface topography enabling us to better understand and predict ocean circulation and its effects on climate.



Yearly averaged ocean surface topography of the Pacific Ocean from 1998–2003. The color scale indicates deviations from the mean topography computed from the TOPEX/Poseidon data record from 1992 to 2002. (Image processing by L-L. Fu.)